

Atomic Mass of Noodlium

The atomic mass of an element recorded in the periodic table represents the average mass of naturally occurring isotopes of the element. This average is calculated based on the mass number and the relative abundance of each of the isotopes. Therefore, the atomic mass of an element is not a whole number since it is the weighted average of the masses of the different isotopes. All atoms of the same element have the same number of protons in their nuclei but the number of neutrons may vary. Since each neutron has their atomic mass unit of 1 amu this will result in atoms with different atomic masses but the same number of protons. The atomic masses of atoms do not increase regularly as their atomic numbers increase because their neutrons increase irregularly.

Materials and equipment: Electronic Balance Sample of Noodlium

Procedure

1. Obtain a sample of “Noodlium” from your teacher. It contains a mixture of different isotopes, i.e., pasta noodle varieties.
2. Measure and record the total mass of the sample with the cup. _____
3. Carefully empty the contents onto a large flat surface. Measure and record the mass of the empty container.

4. Subtract this empty container mass from the total mass to give the mass of the sample alone. **SHOW WORK**
(Place your answer on the line provided)

Mass of “Noodlium” sample _____

5. Calculate the average mass of each noodle (total mass of sample/total # of noodles) **SHOW WORK**

Unweighted Average Mass of each noodle _____

6. Sort the “pasta noodles” by type. Check the total number of noodles. Record the data.

<u>Type of noodle</u>	<u>Number of noodles</u>
a) _____	_____
b) _____	_____
c) _____	_____
d) _____	_____

7. Find the mass of a “pasta noodle” of each type. Determine the average by measuring the mass of 10 noodles of each type and dividing by 10.

<u>Type of noodle</u>	<u>Average mass (g)</u>	<u>Work</u>
a) _____	_____	
b) _____	_____	
c) _____	_____	
d) _____	_____	

8. Calculate the percentage of each noodle type (isotope) in the sample, using this formula:

$$\text{Abundance} = \frac{\text{\# of noodles of a given type}}{\text{Total \# of noodles}} \times 100\%$$

<u>Type of noodle</u>	<u>Abundance (%)</u>	<u>Work</u>
a) _____	_____	
b) _____	_____	
c) _____	_____	
d) _____	_____	

9. Determine the weighted average atomic mass of noodlium using the formula. **SHOW WORK**

$$[\text{mass}_a \times \text{abundance}_a] + [\text{mass}_b \times \text{abundance}_b] + [\text{mass}_c \times \text{abundance}_c] + [\text{mass}_d \times \text{abundance}_d]$$

100

Weighted average mass of noodlium is: _____

Questions

- 1) Is your weighted average mass (9) consistent with the unweighted average mass (5)?
- 2) Define isotope. Explain the differences between neon-19, neon-20, and neon-22.
- 3) The following are natural isotopes of magnesium. Calculate the average atomic mass of magnesium given the following % abundance.

Magnesium -24 78.99% Magnesium -25 10.00% Magnesium -26 11.01%